

Claims

1. A catalyst-coated membrane comprised of:
 - (a) an ionomer membrane, wherein said ionomer membrane comprises two surfaces and each of said two surfaces is comprised of:
 - 5 (i) an active area, wherein said active area is coated with a catalyst layer, and
 - (ii) a passive area; and
 - (b) at least one layer of protective film attached to each of the two surfaces of said catalyst-coated membrane, wherein said at least one layer of protective film overlaps the passive area and the active area.
- 10 2. The catalyst-coated membrane according to claim 1, wherein said passive area forms a perimeter around said active area.
- 15 3. The catalyst-coated membrane according to claim 1, wherein the region of the active area that is overlapped by the at least one layer of protective film is in the range of 0.5 to 20 % of the total active area of the membrane, and the region of the passive area that is overlapped by the at least one layer of protective film is in the range of 80 to 150 % of the total passive area.
- 20 4. The catalyst-coated membrane according to claim 1, wherein the at least one layer of protective film comprises an organic polymer material with a thickness in the range of 10 to 150 microns.
- 25 5. The catalyst-coated membrane according to claim 4, wherein the organic polymer material comprises a polymer selected from the group consisting of polytetrafluoroethylene, PVDF, polyethylene, polypropylene, polyester, polyamide, co-polyamide, polyamide elastomers, polyimide, polyurethane, polyurethane elastomers, silicones, silicon rubbers, and silicon based elastomers.

6. The catalyst-coated membrane according to claim 1, wherein the ionomer membrane comprises a substance selected from the group consisting of perfluorinated sulfonic acid polymers, acid-doped polybenzimidazoles, acid-group-modified polyetherketones, ionically conductive organic/inorganic materials and composite reinforced materials.
7. A process for manufacturing a catalyst-coated membrane, said process comprising applying at least one layer of protective film to two surfaces of an ionomer membrane under pressure and heat for a period of 0.1 to 15 minutes, wherein said two surfaces each comprise a passive area and an active area, wherein said active area is coated with a catalyst layer.
8. A process for manufacturing a catalyst-coated membrane according to claim 7, wherein the pressure is in the range of 10 to 100 bar and the heat establishes a temperature in the range of 20 to 200°C.
9. A membrane-electrode-assembly comprised of:
- (a) an ionomer membrane, wherein said ionomer membrane comprises two surfaces and each of said two surfaces is comprised of:
 - (i) an active area, wherein said active area is coated with a catalyst layer, and
 - (ii) a passive area; and
 - (b) at least one gas diffusion layer, wherein said at least one gas diffusion layer covers the active area of said catalyst-coated membrane; and
 - (c) at least one layer of protective film, wherein said at least one layer of protective film contacts the active area, the passive area and the gas diffusion layer to form:
 - (i) an overlapped region of the active area,
 - (ii) an overlapped region of the passive area, and

(iii) an overlapped region of the gas diffusion layer.

10. The membrane-electrode-assembly according to claim 9, wherein the region of the active area contacted by the at least one layer of protective film is in the range of 0.5 to 20 % of the total active area of the membrane, the region of the passive area contacted by the at least one layer of protective film is in the range of 80 to 150 % of the total passive area of the membrane and the region of the gas diffusion layer contacted by the at least one layer of protective film is in the range of 0.5 to 50 % of the total area of the gas diffusion layer.
11. A process for manufacturing a membrane-electrode-assembly, said process comprising applying a gas diffusion and at least one protective film to two surfaces of an ionomer membrane under pressure and heat for a period of 0.1 to 15 minutes, wherein said two surfaces each comprise a passive area and an active area, wherein said active area is coated with a catalyst layer.
12. A process for manufacturing a membrane-electrode-assembly according to claim 11, wherein the pressure is in the range of 10 to 100 bar and the heat establishes a temperature in the range of 20 to 200°C.
13. A method of using the catalyst-coated membrane of claim 1, comprising operating a PEM or DMFC fuel cell stack that comprises the catalyst-coated membranes of claim 1.
14. A method of using the membrane-electrode-assembly of claim 9, comprising operating a PEM or DMFC fuel cell stack that comprises the membrane-electrode-assembly of claim 9.